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EXAMINER

SCHIFFMAN, BENJAMIN A

ART UNIT	PAPER NUMBER
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1742

NOTIFICATION DATE	DELIVERY MODE
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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/555,663	Applicant(s) FUJIKAWA ET AL.	
	Examiner BENJAMIN SCHIFFMAN	Art Unit 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,8-18,20 and 21 is/are pending in the application.
- 4a) Of the above claim(s) 10-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-6,8,9,20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. The papers submitted on 25 October 2010, amending the title and claim 1, and adding claims 20 and 21, are acknowledged.

Election/Restrictions

2. This application contains claims 10-18 drawn to an invention nonelected with traverse in the reply filed on 25 October 2010. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 3, 8, 9 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cuisin et al. (Fabrication of three-dimensional photonic structures with submicrometer resolution by x-ray lithography) in view of Fujikawa et al. (Surface Fabrication of Interconnected Hollow Spheres of nm-Thick Titania Shell) and Wen et al. (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach).

7. Regarding claim 1, Cuisin discloses a method of forming a submicrometer, i.e. nanometer, material (**see abstract**) with the steps of forming a mold from a thin film by a lithographic method on a substrate, in this case the mold is formed in a layer of PMMA, i.e. a resist, deposited upon Si/SiC/W substrate (**see pp. 3506-7, section II**); forming a metal oxide on the PMMA layer, i.e. forming a organic/metal oxide composite layer; and finally removing the PMMA layer, to form a metal oxide submicrometer structure having a shape replicated from the recessed pattern of the film (**see p. 3508, section IV**).

8. Cuisin does not appear to explicitly disclose that the oxide film is formed by bringing a metal compound capable of reaction with hydroxyl or carboxyl groups present into contact with

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a forming surface and hydrolyzing the metal compound to obtain the oxide. Although Cuisin does describe that the oxide is formed by a sol-gel process, which is a process of bringing a liquid precursor containing a metal compound into contact with a surface and hydrolyzing the metal compound to form a metal oxide.

9. However, Fujikawa discloses a method of forming a nanostructure (**see title**) wherein oxide thin film is formed on latex beads forming an organic/metal oxide film the latex having a carboxylated surface and the titania film is formed on the latex surface through a sol-gel process (**see p. 1134**).

10. At the time of invention, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of Cuisin to include the carboxylated surface of Fujikawa, because the sol-gel technique is a known method of applying metal oxide thin films and would obtain predictable results.

11. Additionally, modified Cuisin does not appear to explicitly disclose activating the mold by a oxygen plasma treatment or ozone oxidation treatment. Furthermore, one of ordinary skill in the art would recognize that the latex of Fujikawa must have been chemically modified to form the carboxyl groups; as unmodified latex does not have carboxyl functional groups.

12. However, Wen discloses sol-gel process (**see title/abstract**) wherein the adhesion between the sol and a plastic substrate, such as PMMA, can be improved by treating the substrate with oxygen plasma (**see p. 1679 col. 2**).

13. At the time of invention, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of modified Cuisin to include the plasma treatment of Wen, as this would increase the adhesion between the oxide layer and the substrate and allow for better

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handling before the removal of the plastic substrate/mold. Further, such plasma treatment would result in an increase in the number of carboxyl and hydroxyl functional groups in the substrate polymer and thus result in a stronger bond between the substrate and the oxide layer.

14. Regarding claim 3, Cuisin discloses that the PMMA mold, i.e. the organic portion of the organic/metal oxide composite, is removed (**see pp. 3508, section IV**).

15. Regarding claim 8, Cuisin discloses that the mold is formed in PMMA, i.e. an organic compound (**see pp. 3506-7, section II**).

16. Regarding claim 9, Cuisin discloses that the mold of PMMA is removed by calcination, i.e. baking (**see p. 3508, section IV**).

17. Regarding claim 21, Cuisin discloses that the PMMA pattern is on the order of 1 micron (**see fig. 2**), which overlaps the claimed range (**MPEP § 2144.05**).

18. Claim 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cuisin et al. (Fabrication of three-dimensional photonic structures with submicrometer resolution by x-ray lithography) in view of Fujikawa et al. (Surface Fabrication of Interconnected Hollow Spheres of nm-Thick Titania Shell) and Wen et al. (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach) as applied to claim 1, and further in view of Li et al. (A High-Rate, High-Capacity, Nanostructured Sn-Based Anode Prepared Using Sol-Gel Template Synthesis).

19. Cuisin discloses a method of forming nanostructure as described in the 102(b) rejections of claim 1 and 3 above.

20. Cuisin does not appear to explicitly disclose a step of removing the substrate from the mold/organic portion of the organic/metal oxide composite.

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21. However, Li discloses a method of making nanostructures (**see abstract**) with the step of removing the metal oxide nanostructure from the substrate (**see p. A165 col. 1**).

22. At the time of invention, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of Cuisin to include the substrate removal step of Li, in order to inspect the formed nanostructure with a TEM (**see p. A165 col. 1**).

23. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cuisin et al. (Fabrication of three-dimensional photonic structures with submicrometer resolution by x-ray lithography) in view of Fujikawa et al. (Surface Fabrication of Interconnected Hollow Spheres of nm-Thick Titania Shell) and Wen et al. (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach) as applied to claim 1, and further in view of Kenausis et al. (Poly(l-lysine)-g-Poly(ethylene glycol) Layers on Metal Oxide Surfaces: Attachment Mechanism and Effects of Polymer Architecture on Resistance to Protein Adsorption).

24. Cuisin discloses a method of producing a nanostructure as discussed in the above 102(b) rejection of claim 1.

25. Cuisin does not appear to expressly disclose covering at least a portion of nanostructure, or the mold/organic portion.

26. However, Kenausis discloses a polymer coating for a metal oxide surface (**see abstract**).

27. At the time of invention, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of Cuisin to include the coating of Kenausis, in order to convert the oxide from a strongly interactive surface to a noninteractive surface in applications such as biomaterials (**see abstract**).

28. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cuisin et al. (Fabrication of three-dimensional photonic structures with submicrometer resolution by x-ray lithography) in view of Fujikawa et al. (Surface Fabrication of Interconnected Hollow Spheres of nm-Thick Titania Shell) and Wen et al. (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach) as applied to claim 1 above, further in view of Milella et al. (Preparation and characterisation of titania/hydroxyapatite composite coatings obtained by sol-gel process).
29. Modified Cuisin does not appear to expressly disclose that the sol-gel, i.e. step (a), is carried out by a dipping method.
30. However, Milella discloses a sol-gel process wherein a sol-gel coating is applied by dipping (see pp. 1425-1426 §2.1).
31. At the time of invention, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of Cuisin to include the dipping of Milella, because dipping is a conventional means of applying a sol-gel to a substrate and one of ordinary skill in the art would apply the sol of Cuisin by dipping in without undue experimentation or unexpected results.

Response to Arguments

32. Applicant's arguments, see pp. 7-10, filed 25 October 2010, with respect to the 35 U.S.C. § 103(a) rejection of claims 1, 3-6, 8 and 9, have been fully considered and are not persuasive.
33. Applicant describes the instant invention as a process wherein the **whole** mold is subjected to an oxygen plasma treatment and the **whole** mold is brought into contact with the metal compound or a combination of an organic and a metal contact. However, the instant claims

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interpreted in light of the specification, upon which the Examiner's rejection is based, does not require the **whole** mold but rather requires, "activating the mold by oxygen plasma treatment or ozone oxidation treatment" and "bringing a metal compound or a combination of an organic compound and a metal compound into contact with the forming surface [of the mold.]" Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, at least applicant's characterization of the rejected claims is not based on the instant claims.

34. Further, applicant argues that Cuisin disclose that a liquid precursor of TiO_2 prepared by the sol-gel method is merely infiltrated into galleries formed by a lithographic method.

Therefore, Cuisin would prefer not to bring the precursor into contact with anything except the galleries. However, nowhere in Cuisin is the infiltration of the TiO_2 sol explicitly excluded and applicant has not presented further evidence that the process of Cuisin would only fill the galleries. Therefore applicant's argument is merely conclusory.

35. Applicant continues, that a skilled artisan would "normally consider that improvement of adhesiveness between PMMA and the precursor hinders formation of a desired nanostructural body because the precursor becomes likely to adhere to a part except the galleries" and therefore the skilled artisan would not combine Wen (which teaches improved adhesion) with Cuisin (which applicant contends teaches only filling galleries). However, arguing, that Cuisin discloses filling the galleries exclusively, applicant has not presented evidence to suggest that the improved adhesion of Wen would destroy the Cuisin process. Applicant has merely made a statement that an increase in adhesion would destroy the Cuisin infiltration. In fact the skilled

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artisan would recognize that the increased adhesion would improve the Cuisin process as the surface would have a greater affinity to the sol and would wet the surface area more readily, thus filling the galleries via capillary action.

36. Applicant has mischaracterized the instant claim, made conclusory arguments about Cuisin, and fails present evidence to support their argument against the combination of Wen and Cuisin. Therefore, applicant's arguments do not overcome the prima facie case of obviousness set forth in the rejection above.

37. With respect to Fujikawa, Li and Kenausis, applicant presents no further arguments other than those addressed above with respect to Cuisin and Wen.

Conclusion

38. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mizutani et al. (Coating of polymethylmethacrylate with transparent SiO₂ thin films by a sol-gel method) discloses a sol-gel method wherein the sol is applied by dipping.

39. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

40. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

41. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN SCHIFFMAN whose telephone number is (571) 270-7626. The examiner can normally be reached on Monday through Thursday from 9AM until 4PM.

42. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, CHRISTINA JOHNSON can be reached on 571-272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

43. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BENJAMIN SCHIFFMAN/
Examiner, Art Unit 1742

/Christina Johnson/
Supervisory Patent Examiner, Art Unit 1742